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ABSTRACT

This pamphlet, one in a series entitled "What Research Says to the Teacher," discusses some aspects of the learning process and provides suggestions that may be helpful to classroom teachers and prospective teachers. The contents include: (1) "What Do We Learn," which deals with words and their meanings, skills, attitudes, and conduct; (2) "When Are Children Ready to Learn," which discusses the aspects of health, adjustment, maturation, and interest; (3) "What is the Right Answer," which covers agreement with known facts, social class sanctions, goal attainment, and reward and punishment; (4) "What Do Children See," which looks at perception of things in patterns, cues for words and meanings, cues for motor skills, cues for attitudes, and cues for enjoyment; (5) "Why is Practice Necessary," which discusses repetition for retention, and repetition for improvement; (6) "How Do Children Learn to Think," which deals with locating the problem, holding on to the problem, suggesting answers, predicting outcomes, getting the facts, and sticking to logic; and (7) "Can Children Use What They Have Learned," which discusses the conditions that might stimulate a child to use what he has learned. Selected research references and general references are included. (WR)

WHAT RESEARCH SAYS TO THE TEACHER

6

The Learning Process

William Clark Trow

Association of Classroom Teachers
of the National Education Association

The "What Research Says to the Teacher" Series

is published to provide classroom teachers and prospective teachers with concise, valid, and up-to-date summaries of educational research findings and their implications for teaching.

Each pamphlet in the series is designed to serve two prime functions: to suggest principles and practical procedures that may be applied directly by the classroom teacher and to provide a springboard for further study and use of research findings.

To serve the first purpose, authors of booklets in the series select from each field those research findings that promise to be of most help to the classroom teacher. However, research has not yet provided scientifically valid findings on many aspects of teaching. In such cases, the best that can be offered is expert opinion.

It is impossible, of course, to provide a complete summary of research in any field in 32 pages. To help teachers further explore research findings, selected references are listed at the end of each booklet in the series.

The series was initiated in 1953 by the Department of Classroom Teachers (now Association of Classroom Teachers) and the American Educational Research Association under the leadership of Frank W. Hubbard, in his capacities as director of the Research Division, secretary-treasurer of the AERA, and assistant executive secretary of the NEA. Beginning in 1966, the Department of Classroom Teachers assumed full responsibility for publication of the series, with the assistance of the NEA Publications Division. One measure of the success of the series is the use of approximately two million copies of the booklets by educators in the United States and throughout the world.

New titles and revisions of existing titles are published each year. See the outside back cover for a list of current booklets.

SIDNEY DORROS, *Series Editor*

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The Learning Process

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EXPLANATION

One trouble with generalizations about learning processes is that, because they *are* general, they are not always seen to apply to specific learning situations. They sometimes seem "theoretical" and not "practical." However, many of them lead to new insights and point the way to useful teaching methods. More than this, they tend to unify teaching practice so that instead of there being a separate method for teaching all the different parts of the different school subjects, various methods fit together into a more unified and intelligent approach to specific problems of teaching and learning.

In this booklet some important questions about learning are asked, and answers that have proved helpful to many teachers are given. The 1954 edition was prepared by William Clark Trow of the School of Education, University of Michigan. It was revised in line with suggestions made by Guy T. Buswell, University of California (Berkeley); Sidney L. Pressey, Ohio State University; J. Warren Tilton, Yale University; and the staff of the NEA Research Division. This revised edition was prepared by Dr. Trow with the assistance of the editor of the series, Frank W. Hubbard of the NEA Information Services.

THE LEARNING PROCESS

WHEN CHILDREN are learning how to sound words, or how to add or spell, or how to do a square dance, or how to take part in a room-committee meeting, they are doing specific things. Teachers can observe what children do and help them improve their performances. Likewise, investigators can observe these same kinds of specific situations, but more carefully under controlled conditions, in order to find out which are the better ways of learning to do these things. From the great number of such studies that have been made, it is possible to arrive at certain generalizations that hold true for many different kinds of learning.

WHAT DO WE LEARN?

No one can just learn, the way he can laugh or run. A person learns *something*. That is, he makes some responses that he could not make before, as when he learns to swim. Or he makes a familiar response that he couldn't make before under just those circumstances—saying "dog" when he sees D O G, or writing 30 when he sees 5×6.

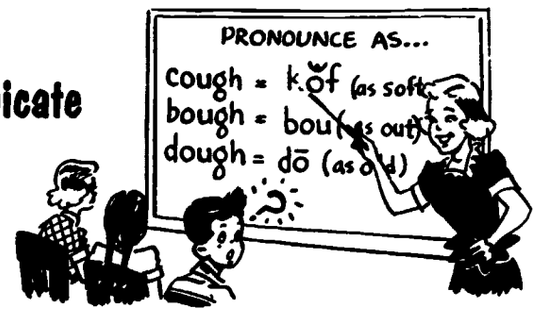
A great deal of our lifetime is spent in learning, some of it in schools and colleges, much of it in the ordinary experiences of life—from people, printed matter, or the air waves. We can't teach pupils everything in school, and fortunately we don't have to. But we can build on their experiences and supplement them in important ways. And there is so much to learn that we want the process to be as efficient and effective as possible. Let us first, therefore, consider what it is that pupils learn.

Words and Their Meanings

The big job of the school is to introduce the successive waves of children to the symbols of communication. In spite of all the activities of the modern school, the teacher's main concern is with what Hamlet said he was reading: "Words, words, words!" Of course, this includes not only the learning of the "three R's" but also the development of concepts and meanings in literature, sci-

ence, and the arts. Fortunately, children already have a tremendous start by the time they come to school. They can speak a language they had never even heard of six years before. How many of us expect to speak French, or German, or Hindi six years from now as well as the average first grader speaks English?

Learning to communicate isn't easy



But they yet have to learn to read and to write and to spell, and this is no easy task with a language which fits its letters as poorly as English does. It is much easier in a language like Italian in which the letters can be counted on to sound the same each time one meets them. No *bough, cough, through, rough,* and *dough* in Italian! (By the way, how do you pronounce *sough?*) Yes, it is a difficult language, and, unfortunately, its grammar wasn't made for it but for Latin, which is an inflected language, whereas English is not. As in other subjects, fine differences must be perceived, and just the right responses must be learned for each. The language laboratory and programed lessons, whether or not teaching machines are used, can be very helpful here.

Grammar and syntax are only a small part of the process of learning the meanings of words. Even a definition—the attempt to learn a word meaning from still other words—is often not very effective. The sixth graders who memorized the definition of a verb as "a word that asserts" had no idea whatever of the meaning of *assert.* Children acquire meanings by connecting words with the experiences they have with the things the words stand for or symbolize. These experiences may be obtained directly, or vicariously through various audiovisual materials, including television.

And children have to learn that the same word means different things in different contexts. Some are easy, like the difference between a brass band and a rubber band, but others are more difficult, like a democratic state and a gaseous state. And they also have to learn about semantics—how words are used not only to explain but also to persuade, to confuse, to deceive, to thrill, and to inspire.

Skills

But children are expected to learn more in school than the wonderful things that can be done with words. They are expected to acquire skills, not only word skills like writing, speaking, and singing, but manual and bodily skills that find expression on the playground, in the shop, and in the band or orchestra. Films and recordings can be of much help here, especially when taped instructions to accompany them are further developed. But team or ensemble performance requires sk 'ed personal direction. Many of the skills children begin to acquire will be enjoyable at the time, and many of them will continue to be useful and satisfying long into their adult years.

Attitudes

Children also learn attitudes. Many attitudes are acquired at home, and some are the result of pleasant or unpleasant experiences they may have had with different kinds of people. But schools can do a great deal to develop in children desirable attitudes toward their classmates—attitudes of fair play, friendliness, and cooperation—which make their lives and the lives of those around them more agreeable. And schools can do a great deal to develop in children desirable attitudes toward t' . school work, toward their teachers, and toward the whole educational process. In this task, school psychologists can often help.

We know that sometimes children transfer their hostile attitudes from their parents to such other authoritarian figures as the classroom teacher or principal. In such cases, teaching is more difficult, and the punishment that is often meted out to such children is not a very intelligent teaching method. When a teacher finds out what kinds of l.c ... uch children come from, often he is surprised that they l» as well as they do. But it takes

children some time to learn different attitudes, just as it takes time to learn words and skills.

Conduct

Classroom teachers have always insisted on children's behaving properly in school. In the old days of the one-room school, the teacher often had to lick the biggest boy before anyone would behave, and sometimes the big boy won and the teacher had to look for another job. And where things were not so drastic, certain standards of behavior were demanded of children, such as sitting still, being quiet, doing what they were told—a kind of passive and superficial morality.

Nowadays, we expect children to be quiet at times, but we know that their dynamic energy systems demand activity, and so they are not repressed all the time. A few adults think children are not repressed enough in school, but the proper balance seems to be one which is best for the different kinds of things children at a particular age should be expected to learn. The objective is that they gradually learn what behavior is appropriate for different situations. Instead of having to be disciplined, children learn to discipline themselves. For example, a parent of a third grader called for his child for a special purpose before school was out and found him and the other children busily at work. "Where is your teacher?" he asked. "I don't know. Isn't she here? Maybe she is in the next room," was the answer. It is hard to say in what proportion of the schoolrooms of the country this incident might be repeated, perhaps in a good many. Where it could happen, we know that children are on the way to learning self-discipline.

WHEN ARE CHILDREN READY TO LEARN?

We have heard a great deal about reading readiness in the past few years, but for other subjects there is a tendency to think that children are "ready" to learn whatever happens to be in the course of study for the grade they are in. The result is that fruit-

less efforts are often made to teach children what they are not yet mature enough to learn. When are children ready to learn?

When They Are Healthy

While it is generally known that physical defects should be corrected whenever possible, it is not always as easy as it might be to correct them. For example, parents who have been told that their children need glasses sometimes do nothing about it. But in spite of difficulties, physical examinations are important, and one has to follow through as best he can. Sometimes children need sleep more than they need instruction; and the child who does not pay attention, who is underactive or overactive, fidgety, cross, or tired, probably needs a physical examination more than a reprimand. Such children are not ready to learn anything; until something can be done about their physical condition, there is not much use trying to teach them.

When They Are Well Adjusted

Everyone seems to be satisfied that the harsh punishments of a century and more ago have disappeared, but a few self-appointed critics of modern education are dubious about the practices of better schools where children are not given failing marks and are promoted to the next grade whether they can "do the work" or not. These critics say life is competitive, that children should get used to the idea that they have to work for what they get and should not be coddled. People who talk this way do not realize that promotion is not a reward, but a moving forward, a placement into an environment that is most conducive to the learning for which the child is ready. Competition should be among equals. When the marking system symbolizes competition among children of widely differing abilities, the less able who are forced to work at tasks too difficult for them may become resentful or aggressive or apathetic, or they may seek to escape (play truant). Ideally, there should be no grades in which all or nearly all children of like age move along together. Instead, each child should proceed at the rate he can travel in each subject. Now the possibilities of such individualization are beginning to be realized by means of programed instruction, thus largely eliminating frustrations of this kind.

Bad school practices are not the only conditions that frustrate children unduly and produce undesirable attitudes and maladjustments of one kind or another. They may be the result of unsatisfactory home conditions, of brutal beatings by fathers, of constant quarreling and fighting between parents, of feeling unwanted, of shame for what their parents or other relatives have done, or of their own fancied or real misfortunes. Children tend to carry over into school the anxieties, the antagonisms, and the aggressive or retiring behavior they have developed at home.

Such children will not be ready to learn spelling, arithmetic, or anything else right away. They will have to get a little better adjusted first. They must be carried along for a while until they begin to get straightened around. There is no need to expect much of them for a few days or even a few weeks or months. When they find that they are "accepted" at school and that everybody is not against them, they will begin to learn again.

When They Are Mature Enough

The familiar term, "reading readiness," applies to physiological and psychological maturing. We know that it is very inefficient to try to teach children to read before their mental age reaches about 6.5 years. By that time, most of them are ready to begin; before then, they are not. So various kinds of prereading experiences are provided—listening to stories, looking at pictures, telling about things that happened, and the like. Experienced teachers can tell when a child is ready to read, although tests may help, especially when classes are large.

A few children do not seem to be ready even when their mental ages attain the magic 6.5. Sometimes emotional maladjustments are involved. Sometimes children prefer to be read to, and seem to be afraid to lose this sign of interest and affection as they think they will if they learn to read themselves. Or they may be uninterested in the simple reading they have to begin with as compared with the more mature stories that have been read to them. Having rejected reading while the other children were learning, they may feel inferior because of their mistakes when they do try. Or it may be that, though the mental test score is high enough, other basic maturing has not taken place. In any case, there is one thing we do know: while opportunity and

encouragement are desirable, any form of pressuring works in the opposite direction.

But what of readiness for arithmetic, geography, history, or poetry? The same principles apply. Pupils mature gradually, each at his own rate. Even children in the same grade are not equally ready to learn the same things. This is because a grade is a group of children of about the same age who are maturing at widely different rates and who are being provided with the kinds of experiences that will help them in the maturing process.

Immature, slow learners may learn better if they drop back with the next younger group, although many pupils who are compelled to repeat a grade do no better the second time over than they did the first and would have learned more if they had been allowed to go along with their group. The fast learners will be likely to do better if they are placed in the grade ahead.

But whatever the promotion policy of the school, there is often a range in ability of approximately six years in any one grade. Thus, one 10-year-old child in the fourth grade may be as able as the average 13-year-old, and another may be no abler than a 7-year-old. This situation is a disadvantage for all concerned—for the slower growing, because they are faced with tasks they cannot perform; for the average, because the teacher must try to adapt instruction to the slow and to the bright; and for the fast growing because they are ready for tasks that do not appear in the school program until later, so they are bored by explanations they do not need. Such children are likely to think up in-

teresting ways to amuse themselves which the teacher may not appreciate. In the traditional school there is no cure, there are only palliatives—differentiated assignments, special projects, temporary subgrouping, and the like.

A real solution lies in the ungraded school, which exists here and there in a few of the more enlightened communities. The plan begins at the primary level where, during their earlier years in school, the children are pooled, so to speak, until they develop their communication skills sufficiently to proceed with regular instruction, which may take anywhere from two to four or more years. This primary pool may be taught in room-sized groups or in larger flexible groups by teacher teams. But pupil differences continue: most slow growers continue to grow slowly, and many fast growers continue to mature rapidly. Programed instruction makes it possible for each pupil to continue at his own rate in each subject instead of trying to compel all to proceed together like ships in a convoy.

When They Are Interested

Even when children and young people are healthy, well adjusted, and sufficiently mature for the task at hand, they may still not be interested in doing it. We say they are not motivated or that they are not working up to capacity. This last phrase calls for a little attention before going into the question of motivation.

Actually we cannot be absolutely sure just what a student's capacity is. The tests of general mental ability give a rough approximation, and those of special aptitudes make the focus a little sharper. Interest questionnaires reveal a related dimension. But each individual is unique, and his idiosyncratic personality pattern may not fit the common mold.

And further, we should hardly expect children and adolescents to work up to capacity in everything they do. Certainly we adults do not. True, we work close to capacity on some things, but on others—say our knowledge of the theater, sports, modern music, or even politics—we are content to ride along, picking up a little here and there as we go.

Then, too, there is a possibility that in cases of low motivation, as in other frustrating situations, rationalization may appear. The

teacher ascribes a cause: the student does not perform at full capacity because he is lazy. Actually, the student may not have a low metabolic rate, may not be maladjusted, may not be confronted with inappropriate tasks, and may not really be lazy. Let's face it: the instruction may be just plain dull and incompetent.

One teacher was persuaded to abandon traditional methods of assigning, testing, and marking. She tried a new method others were talking about—teacher-pupil planning, individual and group projects, and so on. Suddenly the class became alive, the pupils began asking her questions, and she didn't know the answers. They asked for books and magazines she couldn't find, they wanted to visit places she had never heard of, and they wanted to make models she didn't know how to make. It was terrible! Things couldn't go on that way. So pretty soon she got everything back in order again—assign, test, mark. And after that some of the children were lazy. They didn't work up to capacity.

The moral of this sad story is that when children can work individually or in groups to find out something, they are more than likely to show unexpected enthusiasm, initiative, and perserverance. But when the object is only to get a mark—well, that's something else again.

Of course, miracles do not always happen. Pupil-teacher planning and setting up projects (they don't necessarily go together) usually require wise guidance. Otherwise, children may attempt the impossible and then be disappointed. Or they may prefer to let the teacher do the planning, just as some school faculties prefer to let the principal give the orders. They feel secure that way because all they have to do is do what they are told, and it leaves them free to complain if things don't come out right.

But group-process methods are not the only solution. The teacher who knows more of his subject matter than is found in the students' textbooks or is shown on TV can often suggest work that will interest those who are not motivated to learn through routine procedures. A girl uninterested in political history may be thrilled by the history of art or dress design, especially if there are illustrated books in the school library. A boy not enamored with regular science work may spend hours hunting and classifying sea or land shells. Another student who may not like the verses in the school reader might have a natural affinity for

"Casey at the Bat" and other romantic American ballads. A boy not interested in making a tie rack might like to make a bookcase, or one not thrilled by touch football might develop considerable skill with a boomerang or tennis racquet. A well-trained school librarian can be of tremendous help in suggesting books and films that interest and motivate pupils for further reading. The materials of all sorts that are available throw the burden of proof on the teacher who says the children are not interested in school work.

It has become increasingly clear that teachers are expected to do too many different things. Few, if any, can do them all as well as they should be done. Already there is considerable differentiation of function, particularly along subject matter lines, although most of this is found in high schools. In elementary schools there are teachers of art and music, special education, and, more recently, modern languages. Pupil personnel services, too, are finding a place, and at all levels. But it is too much to expect that one person can be sufficiently competent to employ all the necessary skills in all the subject matter fields and, at the same time, be nursemaid and clerk and generally serve *in loco parentis*.

Already, schemes for supplying "helping teachers" and clerical assistants are in operation, and team teachers are utilized for different competencies. High-level ability as a group discussion leader and as a teacher-demonstrator do not always reside in the same person, and, for the latter, television has introduced the studio teacher. The language laboratory has taken over the drill function in foreign language study and produced the monitor, while teaching machines are ready to assume the burden of concept formation—thus providing opportunities for the able expositors to become programmers.

As these innovations gradually become current practice, the problem of students who do not work up to capacity can be expected to recede into the background.

WHAT IS THE RIGHT ANSWER?

If pupils can't just learn in general, but have to learn something, how do they know that what they learn is so or that what

they learn to do is correct? How do they learn the right answers and not the wrong ones? What is the right answer? These seem like rather silly questions, but they lead us into some of the most important problems of learning.

Agreement with Known Facts

If a child sees D O G and responds by saying "cat," the teacher doesn't have to tell him he gave the wrong answer; his classmates will giggle and make fun of him, making him generally uncomfortable. However, if he says "dog," everything moves along smoothly. This sort of thing is what happens when children learn to talk, since they learn to pronounce words the way they are pronounced at home and to develop the same language or dialect that those around them use. It happens not only with words but also with habits and skills and with attitudes and conduct. In much that is learned at school, however, the books and the teacher are the authorities: for example, in matters of spelling, "correct" English, multiplication and long division, or the facts of geography.

But in school, as at home, what people learn depends on what follows—whether they get what they want, succeed in doing what they are supposed to do, or get the answers they are supposed to get. What follows is referred to as *feedback*. Feedback may be perceived directly by the learner as when he does or does not hit the ball; or it may and often must be mediated by the teacher, who presumably knows the nature of the correct performance. Whether recognized by the learner or followed by the teacher's "right," "that's better," or the like, learning in these cases is said to be *reinforced*. And reinforced responses in similar situations tend to be repeated. It is important, therefore, that the right responses be reinforced because the responses that are reinforced will be learned whether or not they are the right ones.

Social Class Sanctions

When it is a question of what D O G spells or what is 5×6 or who was the first President of the United States or similar matters of fact about which there is practically universal agreement,

things work out pretty well. But in some cases there is no such agreement as to what is the right answer, particularly when it comes to learning attitudes and conduct. For example, since it is recognized that there is no possibility of agreement in matters of religion and politics, we have all decided that the best thing to do is to agree to disagree, being content to discover what the facts are and allow for varying interpretations and beliefs.

Another area of uncertainty about the right answer is the customs of different cultural groups. In general, so-called lower class groups have a set of accepted customs quite different from middle class people, from whose ranks most teachers are drawn. Teachers are often shocked, therefore, when their pupils are untidy, when they use forbidden words, and when they try to argue and fight their way out of difficulties. Such operating procedures are definitely frowned on in school. Which kind of behavior is right?

Certainly, children from slum areas are not "ready" to learn the attitudes and conduct expected in school, and punishing them seems definitely unfair. They are in the situation of a foreign-born child coming to school unable to speak English. Such children have to acquire a new set of language habits. Similarly, children "from across the tracks" have to acquire a new set of social behavior habits, retaining their old ones for home use and using their new ones at school. It is not easy, and they need special help. They need to be shown what they are expected to do in different situations, to have practice in doing it, and to have their successes reinforced. Otherwise, they will be frustrated by the responses they get to their customary behavior and will develop the usual attitudes of aggression or escape from the hostile school world into which the law has plunged them.

Similar difficulties occur when a child "from one of the better homes" is plunged into the hurly-burly of the so-called lower-middle and lower class groups. Such a child may be "teacher's pet," but that doesn't help him much. In these matters the teacher doesn't have the right answers. The child will be likely to look to the group for his satisfactions and surprise the teacher and his parents with his newly acquired vocabulary. Or he will be rejected by the group and be most unhappy, not at all "ready" to embrace the delights of learning.

If teaching were a skilled trade and not a profession, it would be possible to say exactly what should be done under these circumstances. But the chief characteristic of a profession is that it calls for judgment. If the teacher can recognize what a situation is, he can do this, or this, or this, according to the circumstances. If the teacher recognizes the facts of class differences and sets out not to punish deviations from desired behavior but to *teach* a different pattern of conduct, he will undoubtedly do a better job. He will fail at times, of course, as do members of all professions. The outside influences may be too strong to overcome. But the teacher will succeed more often than he fails if he recognizes that it is the children who have the behavior problems, and that he is there to help them solve them, to help them learn different responses to the situations that face them.

Goal Attainment

We get a clearer view of the whole learning process when people are thought of as goal-seeking organisms, that is, as individuals who are trying to get somewhere, to attain some objective. And what they do to attain the objective tends to be repeated and learned if it is reinforced. The objective is to attain some kind of satisfying state of affairs. It may be the "that's right" of the teacher, or it may be the realization that what they think a word means makes sense when they are reading, or it may be the feeling of acceptance and approval by their elders.

Home and school standards may differ

If this is so, one wonders why children do so many "wrong" things. Part of the answer, of course, is that there are so many things to learn, and the process is slow. But another part is that many wrong answers are reinforced. In word learning of various kinds, the child may not recall whether he was punished or rewarded (told "wrong" or "right") for a certain response. And we have seen that in language and conduct, what is sometimes rewarded at home is not correct at school. Even when children are punished for unacceptable conduct, they are likely to repeat it. This is an interesting situation. For what an adult thinks is punishment may not be punishment for the child. It may be the attention which he craves, and to him it is satisfying.

It has been said that a child learns to do what he does. This much is true in many cases, but it seems more nearly correct to say that he learns to do what he does that is satisfying. If it is more satisfying to cheat and lie than to do his own work and tell the truth, these are the things he will learn to do, no matter how carefully the curriculum has been planned. It is no easy job to reinforce the right responses and make the right conduct satisfying. A child who talks back to the teacher, puts on clowning acts, bullies small children, and engages in other disquieting pursuits is having a satisfying experience. Because he gets the admiration of some of his friends, he can get along without the approval of the teacher.

Reward and Punishment

This brings up the complicated question of the place of reward and punishment. The basic point to hold on to here is that pupils are in school to *learn* all manner of correct responses, and, therefore, they should be treated in a way to make their learning most effective—not only verbal learning, but skills, attitudes, and conduct as well. Punishments are reduced or eliminated in modern schools because it has been found that they just do not promote such learning.

A second point to think about is that many adults threaten or administer punishments not really for the good of the child but for the satisfaction they derive from punishing. Some people will not admit the truth of this statement about themselves, but they will usually agree that it is true of some others. Children are

frustrating to adults, and frustration is quite likely to produce aggressive responses. Furthermore, some people find real satisfaction in dominating others, in making them cringe.

A third point to watch out for is the difference between punishing what a child *does* and punishing the *child*. If the child is not himself rejected, if instead he feels that he is wanted and loved, he can take of lot of scolding and punishment in his stride. And after all, it is an improvement in behavior that is sought. The trouble with punishing the child is that it evokes resentment, hostility, aggression, or escape.

And a fourth point is this. When there are only two possibilities, like a fork in the road with high fences on each side (or, experimentally, a Y-shaped maze), one may learn the "correct" response quickly if that is rewarded and the other is punished. But in life there are so many possible wrong responses, so many mistakes that can be made, that to punish just one of them doesn't help much, even if that one is eliminated. Reinforcing the right response helps the learner to select it, and the others—the wrong responses—by not being emphasized tend to be neglected. Or putting it another way, instead of telling a child what *not* to do in a certain situation, it is better to teach him what *to do*. Instead of saying, "He's got to learn that he can't do that," we can better say, "I've got to teach him that this is the thing to do."

The substitute behavior scheme has been tried quite successfully in some communities to eliminate Halloween depredations. It can be used in other situations much more than it now is. Phrases such as "Now we do this"; "Here's what we do now"; "When somebody does this, a good thing to do (or say) is . . ." can be helpful in suggesting correct behavior. Of course, it will not be immediately successful, but a foreign language is not learned in 10 easy lessons, and learning the complicated interpersonal behavior needed for satisfactory group life takes time. But pupils are in school to learn, not to be punished.

WHAT DO CHILDREN SEE?

In what has been said so far, something called "the situation" has been referred to from time to time, but it has not been described very clearly. We can say that it is what people respond to

in some way or other in the process of getting what they want or attaining their goals. But situations are complex. The question, "Do you see what I see?" points up this fact. The expert sees in a complicated mathematical formula, in a legal case, or in a particular individual what an untrained person does not. Since children, like everyone else, respond to what they see or perceive, this is what decides, at least in part, what their responses will be. So if they are going to learn correct responses, it is important that they see the right things, that is, the significant patterns of things in the total stimulus situation.

Perceiving Things in Patterns

People see things in relation to other things. A simple triangle may be seen as three lines, three angles, or as an enclosed space, apart from the thickness of the lines, the color of the paper, and the amount of illumination. A complicated thing, such as a house, an automobile, or a person, presents an endless number of combinations of things that may be seen by those who know how to look for them. Some things are not seen at all by an observer looking right at them, for example, the color of the curtains in the windows of the house, the make of the car, or the embarrassed frown. Under different circumstances it is important to see some of these things, and children have to be taught what to look for in the patterns of things that surround them. Otherwise they cannot possibly be expected to make the right response.

Cues for Words and Meanings

Let us start with words. We can use the word *cue* to stand for the part we need to watch for if the correct response is to be made. For example, the cue that enables the child to learn the difference between *b* and *d* is the right or left position of the vertical part of the letter; similarly, if he is to distinguish *bog* and *dog*. This is a very simple illustration. Other cues that pupils need to watch for besides letter differences are punctuation marks, word endings, word order, sometimes prefixes, and, in speaking, emphasis and inflections of the voice. Other such cues are decimal points and operational signs in arithmetic; the scale, boundary lines, con-

tours, and colors on maps; and the clef and key signatures in music. Small differences are significant. They are likely to be overlooked, and teachers have to point them out and teach pupils to watch for them.

Patterns of meaning become quite complex, though: apart from word meanings in general, there are the conjunctions and prepositions that indicate relationships. At more complex levels still, there are the relationships between statements and facts or between what a person writes and what his purposes are, patterns that a reader must notice if he is not to be led astray.

While much of a teacher's time is spent in teaching pupils what to *do*, it is easy to overlook the importance of pointing out what they should *look for*. For if they see what they are expected to respond to, the response itself may not be so difficult. The verbal pattern then should be, "When you see this, do this," or "When you see this, what do you do?" or "Before you do this, what do you look for?"

Cues for Motor Skills

The same rules apply for acquiring skills of various sorts, whether children are learning to square dance, make a scrapbook, or play baseball. For example, in baseball the beginner has to learn that when he hits the ball, that is the cue for him to run to first base (if it isn't a foul), that when another batter hits an easy fly, he must stay on his base, and so on. Thus, what he, his teammates, or his opponents do serves as a cue for him. There are certain things he has to watch for.

In learning the individual skills, whether athletic, vocational, or others, the teacher can say, "Watch me. Do it this way." But that doesn't always work. In some cases he can take the pupils' hands and move them around in the right way. This may help but not much. Ideally, he should be able to say something which will serve as a cue or stimulus for the right (or nearly right) response on the part of the pupil. This takes a good deal of ingenuity, but some such verbal cues are more successful than others. And if the pupils don't make the kind of movement the teacher expects when he tells them to do something, it may not be the pupils' fault but the teacher's for not being able to give the kind of cue that calls out the desired response.

But the teacher or coach cannot always be there. So the pupil has to learn to transfer the cue to himself, that is, to see or feel his own performance and tell whether it is correct or not.

Cues for Attitudes

Since there are so many different combinations of parts to every stimulus situation, it becomes quite a task for pupils to learn to pick out the ones that are significant, the ones that should be responded to. There is a story about a child out on the lawn at dusk who saw a little black and white animal with a bushy tail and went up to it saying, "Nice kitty." The child responded correctly to certain parts of the stimulus pattern, but to the wrong ones! Similarly, when a pupil adds 2 and 3.5 and gets 37, he responds correctly to the numbers, but the pattern includes the decimal point which is also significant. Or if he is driving a nail into a board, he may hit the nail all right, but he must also watch out for his thumb. It is not enough merely to see a traffic policeman; one must also watch which way he is motioning.

One of the hardest things to do is to learn to see the stimuli that are significant in attitude responses. As in other situations, the rest of the pattern may be much more noticeable. For many teachers, for example, it is often hard to see in the troublesome, aggressive child the little signs that show that he really feels rejected and needs help. As a result, the teacher's attitude toward him may be one of dislike and hostility instead of sympathy and helpfulness. Children's attitudes toward their playmates are also likely to be governed more by more visible and overt behavior than by the less obvious characteristics. And for adults and children alike, this may work both ways. A person may make a good impression, and it may take some time to learn that he is really rather stupid, or deceitful, or pretentious. Or a person may make a poor impression, and it may take some time to learn that he is really capable, honest, and sincere.

Attitudes toward people are among those things that are learned largely at home, particularly attitudes toward people of different races and nationalities and of different political and religious faiths. But at school, children can learn that, while these matters are important, they are really much less important than

other characteristics that are shared by all. In other words, stereotyped attitudes need to be corrected by pointing out other, perhaps less obvious, characteristics in the total personality pattern.

There are many ways to help children do this which depend on the teacher's professional judgment and skill, such as including children who tend to be rejected in the kinds of activities in which they can reveal their other characteristics and participate in a common enterprise. It is no doubt true that the sharing of common military experiences has done a great deal to remove racial prejudice, but we ought not to have a war to teach people how to correct their stereotyped attitudes.

Cues for Enjoyment

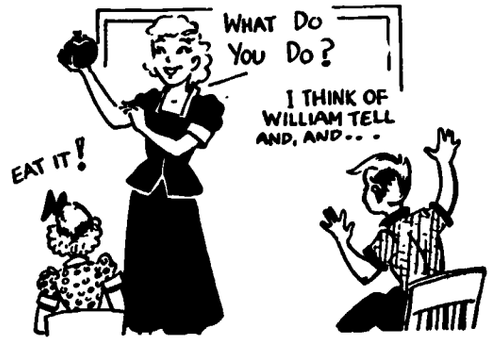
There are, of course, many kinds of attitudes besides those we have toward people. We have favorable or unfavorable attitudes toward almost every phase of our experience. Among the most important of these are the ones which involve the enjoyment of aesthetic patterns.

One of the reasons some people do not get the enjoyment that they might from various art forms is that they do not know what to look for. They do not see the balance in color and design in a modern painting, they do not hear the accompanying instruments and related themes in an orchestral selection, or they do not realize the play of conflicting motives in a literary masterpiece. If such significant patterns as these in a work of art are pointed out, an opportunity for appreciation is provided. But like so many other things, this can be done in wrong or in right ways, in ways that are dull, boring, and pedantic, or in ways that are enlightening and inspiring. A hidden theme can be played by itself on the piano so the pupils will know what they are listening for, or pupils can be asked what balances the red barn on the right or what the music or picture makes them think of.

These better ways are known to teachers, but much is lost if pupils are not given the chance to interpret their experiences themselves—to be creative. Trips and excursions, films and recordings provide clear-cut opportunities for pupils to express their feelings in paintings, stories, verses, songs, marionette shows, or models of various kinds. Craft skills should be a part of the education of teachers so that they can aid pupils in artistic ex-

pression related to the work they are doing. This will result not only in an enhanced enjoyment but also in better understanding of subject matter and a richer appreciation of the underlying values that are the reason for including the subject matter in the curriculum.

Complex relationships must be taught



WHY IS PRACTICE NECESSARY?

Drill has had such an important place in school work for so long that some have come to feel that all that is necessary to learn anything is to repeat it again and again. Experiments have shown, however, that, if repetition is to be of any value, other conditions need to be operating, and fortunately these other conditions tend to make the learning experience more, rather than less, enjoyable. But first, for convenience, we need to distinguish two kinds of repetition—for retention and for improvement.

Repetition for Retention

A pupil may be able to give a number combination, a word meaning, a definition, or a rule today, but tomorrow he may have forgotten it. It is usually necessary to repeat not once but many times.

The older way was to have pupils do it systematically: learn to spell lists of words (first the little ones and later the bigger ones); learn the "tables" in arithmetic, lists of dates, lists of exports and imports; and do "examples." These methods are not used so much now because it has been found to be more efficient

to learn (a) what one is interested in (motivation), (b) what one can use (function), and (c) what forms some kind of pattern (*Gestalt*). Sometimes these conditions can all work at the same time, which makes learning quite effective.

Routine repetition without interest or reward except getting it done results in practically no learning. An order to write something on the board 10 times (or more) is rarely heard in a schoolroom today. But if the pupil wants to learn what he repeats, if he is interested in knowing what he has to learn, and if his successes are reinforced, he will learn more quickly.

Otherwise, routine drills have no particular reason for being. But if a pupil can use what he repeats, if instead of trying to learn to read he reads to learn, if he figures to find an answer, if he speaks to be heard or understood, he will learn more quickly.

Certain German psychologists introduced the word, *Gestalt*, meaning form, pattern, arrangement, or configuration. It has been pointed out that we not only see things as patterns of stimuli but also tend to remember that way. Sentences are remembered better than nonsense syllables. Similarly, one learns words that relate to a project or activity more readily than disconnected words; and dates and events that have some logical relationship are learned more easily than the same items separately. Thus, if the pupil learns things in patterns of relationship, he will learn more quickly.

Repetition for Improvement

When a person keeps trying to do better something that he can't do as well as he would like, such as add, type, skate, or sing, he is practicing. Actually he is not repeating his performance, or if he is, he isn't improving. What he is repeating is the trials, the general pattern of his response, but with variations. The classroom teacher or coach is expected to provide feedback so that improvements can be made in the pupil's performance and so that the next time he tries he will do better. What the teacher says or does we have already referred to as the cue, that is, a stimulus that the pupil learns to watch for to tell him the answer to his question, "How am I doing?" If the teacher says, "Remember to carry," "Wrists up, brush the keys," "Get on top of your skates,"

or "Higher, you are still a little flat," these directions are signals to him to vary his performance a little the next time.

Learners need a great deal of this kind of practice, particularly in skills in which it is important for them to do well. And professional people practice hours every day to improve just a little or to retain the excellence they have thus painstakingly achieved. Both kinds of practice are partly routine, sometimes dull, but often fun. They can be fun more of the time, and also be more effective, if they follow the right principles. And when they are more effective, they are more satisfying, because it is fun to be able to do what one couldn't do before.

HOW DO CHILDREN LEARN TO THINK?

Most of the learning we have been discussing thus far has been the kind in which the answers are known, and it is more expedient to tell them to the pupil than to have him figure them out for himself. There is a danger in too much of this sort of thing, however, because it tends to make pupils too dependent on the teacher and adults too dependent on some supposed authority. Of course, in many situations, like consulting a physician or a lawyer, this is all right. We need consultants and resource persons who can tell us the facts and give us their professional advice.

But many situations occur in each person's life when he has to figure things out for himself. One has to decide things, all kinds of things—which professional person to consult, what to eat for lunch, what courses to take, how to put up the Christmas tree, whether to get more insurance, whether to accept an offer of a job or of marriage, how to vote, whether to join a certain club, what the committee should discuss first, whether to buy a new television set, whom to nominate for office, what to do when one is insulted or thinks he is, to whom one should leave his property, and where he is to be buried. Almost from the cradle to the grave one is faced with problems that he has to find an answer for, and it is a good idea to get some practice in this, too, so that at least the majority of one's decisions are wise ones.

It is pretty clear that it does not do much good merely to tell people to think, or even how to think. But practice in thinking, like practice in everything else, results in considerable improve-

ment when there is good instruction, when the teacher knows the kinds of cues to suggest—cues that the student can gradually learn to recognize for himself.

Locating the Problem

The procedure for individual problem solving can follow that practiced in groups. For the latter, the group leader or teacher must exert a little leadership in order that the problems chosen will be within the competence of the students and educationally worthwhile. Ideally, the problem should grow out of the work the group is doing or out of a question by a class member. It may be considered in a teacher-pupil planning session in answer to the question, "What country do we want to study about now?" Or it may be a seemingly idle remark, like "Why is there water on the outside of the ice-water pitcher?" It may be such a question as "Why don't we have a school newspaper?" or "What should the room-service club do?" or "How can we have a book nook in our room?"

Holding On to the Problem

Probably everyone has attended a committee or business meeting which really had a job to do, but the members took up time telling about various matters of interest that occurred to them, whether these matters had much to do with the subject or not. Unless the chairman was quite skillful, nothing much was accomplished. Children are even more likely to get off the track than adults. So the discussion leader, perhaps by writing the problem on the board or by asking, "What was it we wanted to find out?" will need to help the pupils keep to the subject.

Suggesting Answers

A skillful discussion leader encourages pupils to make suggestions without pressing possible solutions on them. Some answers will be better than others, but if all are not welcomed, few responses will be forthcoming. Among the suggestions that are made will be irrelevant ideas, some of which may be worth noting for later consideration. There will also be suggestions for proceeding as well as snap judgments about the solution of the problem.

Predicting Outcomes

Among the suggestions made, there are likely to be some that seem better than the rest. These can be taken up one at a time, the teacher asking, "What would you expect to happen if we tried this?" Possible *consequences* need to be considered: whether they are desirable or undesirable, the implications of the suggestions, what and who would be involved, costs, possible opposition to the plan, or the support it might receive. On the basis of such considerations, the plan that according to predictions would be most satisfactory can be tentatively selected.

Getting the Facts

Sometimes the problem is merely to find the facts, and sometimes facts are needed in order to solve the problem. In either case, books are a great help, and the librarian can be of real assistance. Or a committee may be appointed to collect needed facts and report back, or a resource person may be brought in, or the group may go on an excursion to find out some of the facts. The story is told of a boy in the Middle Ages who asked his father if cows had teeth. The father answered that, as he recalled, Aristotle had nothing to say on that subject. It did not occur to the father to examine a cow. On the basis of the facts, the tentative solution may be accepted and action taken, provided one has reasoned logically all along.

Sticking to Logic

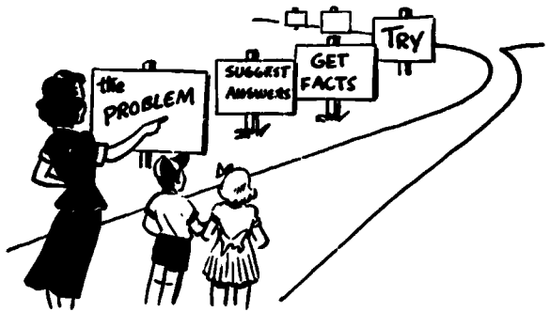
There is, however, a tendency to escape from true causal relations. Because something happened before something else did, the first was not necessarily the *cause* of the second. In the French fable, Chanticleer thought his crowing caused the sunrise. When he awoke late one morning, he found to his dismay that the sun had already risen. Superstitious beliefs, which are derived from the confusion of cause and effect, have worked their way into the folklore, and many children are quite prone to superstitious thinking.

Then, too, judgments need to be as *objective* as possible. Children, like adults, may sometimes let their *prejudices* blind their

reason or be so emotional and "ego involved" that rational judgments are difficult. A child who does not like certain classmates or certain activities may find it difficult to be fair in his decisions.

And it is, of course, important to be careful about concluding that if a thing is so in one situation it will be in another. It is easy to *overgeneralize*, and different samples or specimens may have different characteristics.

We can practice how to think



If a classroom teacher is aware of these aspects of the thinking process and develops the ability to ask the right questions at the right time, pupils can learn to think more effectively within the range of their abilities. As in motor skills, the teacher's questions serve as cues, which will gradually be taken over by the learners, and they will be less likely to be led astray by the faulty reasoning of others.

CAN CHILDREN USE WHAT THEY HAVE LEARNED?

If a young college graduate gets a job in industry, it takes him some time to learn to do what he is supposed to do. Meanwhile he is being paid, although it may be a year or more before what he does is worth what the company pays him. Has he got a job or is he preparing for a job? Of course, the answer to both questions is yes. In the same way, we may ask whether the school years are the life of a child or a preparation for life, and the answer is the same. During the school years, the child is living and growing, and at the same time he is building up the knowledge, attitudes, skills, and appreciations that will be useful to him in the

years ahead. Fortunately, the two objectives are not incompatible, although educational theory tends to shift slightly back and forth between them. Children are in school to learn. The learning experiences serve to build up habits which they can use at the time and which they can continue to use as they grow and mature.

This being the case, the question arises as to how effective the process is. Can they really use what they have learned? The answer here is less certain: sometimes yes, sometimes no. Adjustments in curriculum and method are constantly being made, partly to adapt better to the age and level of development of the pupils and partly to make the program more useful and functional. They should be able to use what they have learned if certain conditions are fulfilled.

If They Have Any Use for It

Certainly students will not be able to use what they have *not* learned, and, therefore, many things that people need to know that were not in the curriculum are now finding a place in it. What is in the curriculum will be likely to be used if the learners ever have any use for it. Most pupils do or will have some need for much of what is found in the curriculum of the elementary school. However, there have been a number of changes in what is taught in some subjects—arithmetic and the social studies, for example. And different curriculums have been developed in the junior and senior high school with a view to adapting better to probable future needs.

If They Remember It

Naturally children won't be able to use what they have learned if they have forgotten it. Hence, a great deal of practice is necessary, not just the same day or week, but through the months and years. Facts and skills earlier acquired tend to fade out or be blocked off by new acquisitions unless they are in pretty constant use. The numerical and communication knowledge and skills, in particular, have to be practiced as they are developed.

If They Know When To Use It

New situations are sometimes disguised so that people don't recognize that they call for previously acquired knowledge and

skills. A story is told about a visiting school inspector who asked the pupils in a class: "If you should dig down deep in the earth, would it be hotter or colder than on the surface?" The children were baffled, so the teacher asked if she might restate the question. She asked them: "What condition exists beneath the earth's crust?" The answer was immediate and unanimous: "A state of igneous fusion!" True, the answer was not exactly meaningful to the pupils, but it was what was called for. They had the answer, such as it was, but they didn't see that it was time to use it. The teacher will not always be present to give the proper cue, suggest the principle or formula, or give the information on the basis of which an answer or judgment might be forthcoming. Hence, it is desirable to provide as many "real life" situations as possible so that pupils will come to recognize the kinds of ways they may use what they have learned.

If It Is in Useful Form

One sometimes hears old-timers, particularly if they are specialists in some other field, complain about modern education. They say pupils should be trained in the disciplines, though it is not always clear what they mean by this, and that pupils should be drilled in arithmetic and grammar. If such critics knew their educational history, they would know that this used to be done, but that it did not work very well.

For example, children used to be drilled on the multiplication tables, and it was found that they had to begin at the beginning of a table to find how much 7×9 was. So now they practice the number combinations and their relation to addition. Or they drilled on paradigms like "I have gone, you have gone, he has gone," and later were quite likely to say, "I have went." It is even reported that one youngster was asked to conjugate "I have a gold mine," so he started: "I have a gold mine, you have a gold yours, he, she, or it has a gold his, hers, or its!" This is a story that points up the fact that the way subjects are conveniently organized is not usually the way they are used. When a particular item is to be used, it has to be hunted down and pulled out of the formal classification system and arranged in a different pattern.

Even in foreign languages that have more useful grammatical systems, learning rules and paradigms, which are essentially classificatory devices, may be less helpful than learning phrases and sentences—hence, the recent explorations by linguists of more direct and efficient methods. In our life experiences, problems as they are commonly met—the spelling and the arithmetic, the economics and geography, or the chemistry and physics—are not in nice separate compartments as they are in school and college. It is the real world of people and things in which children grow up and live, the concrete world of gas stations and farms, of consumer buying and housing, of public health and sanitation.

Education is a serious attempt, not to train children in "the disciplines," but to help them meet the kinds of problems that confront them and will confront them. The systematic organization of knowledge found in the disciplines constitutes the source material. Some few will master the disciplines, or parts of them, and will advance the frontiers of human knowledge. The schools and colleges provide these opportunities, too. Children are provided the experiences which enable them to do what they need to do and will need to do. This is what children are in school to learn. How well they learn depends on how well the classroom teacher uses what is known about the process of learning.

TOPICS FOR FURTHER STUDY

Thousands of investigations have been made of the learning process. The earlier ones by Thorndike on chicks and kittens were supplemented by the conditioning experiments of Pavlov on dogs and the insight experiments of Köhler on chimpanzees. Their followers have elaborated these experiments and devised others, using other animals as well, e.g., Skinner's pigeons and white rats. Following the pioneer memory experiments of Ebbinghaus on himself, human subjects have also been put through all kinds of learning situations.

Such experiments have blocked out the main ideas we have about learning theory, but the relative influence of the different variables is still being explored. It is difficult to control these variables or to evaluate their influences in school situations, yet we know much more than we did about the way children learn. These experiments have given us many new insights.

The numbers below in the parentheses refer to the citations listed under "Selected Research References," page 32.

1. *What principles of learning were developed by Thorndike, Pavlov, Köhler, and Ebbinghaus?* The work of these experimenters is usually discussed in courses in educational psychology. Garrett (3) tells the story of their experiments, which laid the foundation for our knowledge of the learning process.

2. *Why do children misunderstand some of the things they read?* Some students under the direction of Horn (7) have studied the concepts children have of some of the words in their schoolbooks. Another investigation found that in the pledge to the flag the children said, "I pledge a legion," and in "My Country, 'Tis of Thee," they sang, "Land where the pilgrims pried."

3. *How do children learn what is "right" and what is "wrong"?* Bavelas (1) asked children to report what they were rewarded for and what they were punished for at home and who did the rewarding and punishing. (Information of this sort should be regarded as confidential.) By this means he was able to discover something of the nature of children's "sanctions," which form the basis for their later system of values.

4. *Do the ways in which children mature affect their learning?* Olson and Hughes (9) have measured the growth of the same children over a number of years. The more extreme cases they report here show how learning depends on the growth process and that pressuring of various sorts is apt to be useless or even harmful.

5. *How wide are the intelligence differences in any one grade, and how can one adapt instruction to the varying learning needs of the grade?* Cook (2) has measured these differences and discusses what can be done about them. How do his conclusions compare with your situation?

6. *How does reinforcement operate?* Green (4) describes this and other learning processes, particularly in relation to programming.

7. *With what developmental tasks are your pupils ready to have help in learning?* Havighurst (6) enlarges the concept of readiness for things a culture expects of people of different ages.

8. *Does learning to attend to cues help give insight in new situations?* Harlow (5) shows by experiment with discrimination problems how readiness is learned and yet transfers to new problems.

9. *When a pupil has a set to solve problems by a certain method, will he rigidly stick to this method when an easier solution is possible?* Luchins (8) demonstrates that he is likely to and that pupils need to be taught a flexible approach to problem solving.

10. *Can meaning, relationships, and understanding be taught before practice?* Studies by Swenson, Anderson, and Stacey (10) show that active participation may at first be more important than drill.

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